Biomedical Robotics
EEG data analysis assignment 2

Deadline: November 15th

Group ___

Names _____

EMG data preprocessing

1) Load the EMG file EMG_data.mat
   (Fs=1000Hz; 1st row Events: 1='Cue'; 2='Go'; 2nd row EMG signal Right Biceps; 3rd row: Triceps)

2) For each muscle implement the following steps:

   a. Filter (band pass 30-450 Hz) advise FIR filter, recover phase delay 2 with 'filtfilt'.
   b. rectify
   c. compute the envelop of the muscle signals (low pass 3-6 hz)
   d. down-sample the signal

3) Load the motion data kinem_####.mat
   (Fs=100hz; 1st raw Time points; 2nd raw Events 1 STOP, 2 CUE, 3 GO, 4 TARGET, 8 longer than target; 3rd raw x cursor, 4th raw y cursor; 5th raw x target; 6th y target)

4) Considering the experimental design (see below); extract EMG and Motion Data of the first set of movements; the first and last sets of force field; the first set of washout

set	1	2	3	4	5	6	7	8	9	10	11	12
Epoch_start	1	97	193	289	385	481	577	673	769	865	961	1057
Epoch_end	96	192	288	384	480	576	672	768	864	960	1056	1152
Condition	NF	NF	NF	NF	NF	FF	FF	FF	FF	FF	WA	WA

Each set contains 96 movements (48 out and 48 back movements). NF= No Force; FF=Force Field; WA=Washout. Remember: each movement has a Cue and a Go events which help you segmenting into sets

Questions:
Why the down sampling is computed at the end of the EMG processing?

When the muscle activation starts with respect to the movement (see motion signal)?

Which differences can you detect between the sets with and without the application of the force field?

The final folder of the assignment must be named Group_# and it must contain:

The Matlab code with comments and generating the following figures for each muscle and each of the 4 sets you extracted (tip: subplots are easier to understand and follow):

- EMG row signal with on top the filtered signal plotted with a different color.
- EMG rectified with on top the Envelope plotted with a different color.
- The movement signal X and Y in time
- The xy movements signal together with the targets
- this pdf files filled out

Please, do not put additional files in the final folder